

# Online Cashback Pricing: A New Affiliate Strategy for E-Business

*Completed Research Paper*

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## Abstract

*This paper examines the impact of the cashback mechanism on online merchants' affiliate and pricing strategies. Through reimbursing a portion of the transactional amount to consumers in a form of cashback, merchants are able to practice second-degree price discrimination. We develop an analytical framework which explicitly considers the implementation cost associated with the underlying promotional vehicle. We first identify the conditions under which affiliate strategy is profitable. Surprisingly, the promotional “low” price could be actually “high”, relative to the uniform price when cashback is absent. We also propose channel coordination as a remedy to mitigate market inefficiency caused by double marginalization. Finally, we extend our model to a duopoly setting and find that a merchant can benefit from its rival's move into the cashback market. Under some conditions both merchants have no incentive to move alone but prefer its rival to do so.*

**Keywords:** cashback, online advertising, promotion, price discrimination, duopoly

## Introduction

The rise of the Internet and the surging popularity of online shopping have offered rapid growth in e-commerce and garnished companies' interest around adapting best digital marketing strategies. Specifically, affiliate marketing, an Internet-based advertising where a business pays the affiliates for every visitor or sale brought in by the affiliates' own effort, has become a prevalent strategy for online businesses to boost sales volume at low costs (Swan 2011b). In the early days of e-commerce, companies relied on web traffic to establish popularity; now the attention has turned to converting such traffic into actual purchases.

Table 1 shows the breakdown of affiliate type among top 20 sales-generating websites in the United Kingdom from 2006 to 2012 (Swan 2011a). The statistics highlight a dynamic shift in online advertising practice, moving from ordinary methods such as pay-per-click (PPC) to the novel cashback affiliate. Over the years, *cashback* affiliate model – which incentivizes consumers to purchase by reimbursing them with a portion of transactional amount – has received substantial acceptance among online merchants<sup>1</sup> due to its capability of converting traffic into sales. Such higher conversion rates stem from an interesting online shopping behavior noted in *Forbes*: “One good way to find deals is to find the cheapest price ... and then check at Ebates.com to see if there's a cashback offered for the merchant you found” (Rand 2005).

<b>Table 1. Breakdown of Affiliate Type among Top 20 Sales-generating Websites</b>							
Affiliate Method	2006	2007	2008	2009	2010	2011	2012
PPC	13	14	9	7	5	2	3
Coupon code	0	0	3	3	3	5	3
Cashback	2	2	2	4	5	6	7
Content/Others	5	4	6	6	7	7	6

Websites built simply upon the cashback concept, such as Ebates.com and MrRebates.com, are extremely successful. Ebates, the leading cashback site in the U.S. with 12 million registered users, has reimbursed over 85 million dollars to its members since 1998. In 2011 it brokered 900 million dollars in merchandise sales for its 1,600 affiliated merchants. Its revenue growth has trended 50 percent higher for the second year in a row since 2010 (Hoge 2011). Interestingly, cashback sites are not the only ones trying to exploit this new marketing concept. Software giant Microsoft in 2008 implemented the cashback feature that allows its search engine Bing to act as a cashback publisher. One year later, Google also introduced its Google Checkout as a platform on rewarding customers.

There is every reason to believe the cashback concept will continue to grow its popularity. Major consumer banks in the U.S. gradually roll out cashback feature to their online shopping channels<sup>2</sup>, such as Ultimate Reward Mall (Chase Bank), ThankYou Bonus Center (Citibank), and Add It Up Program (Bank of America). Bank of America in August 2012 further leveraged the cashback concept by launching BankAmeriDeals, an innovative program that allows consumers to earn cashback from shopping at physical stores. It has become clear that cashback concept is a catalyst for collaboration between merchants and their affiliate partners, and the enabler for a level of interaction between customers and merchants that has not been possible until now.

<sup>1</sup> By online merchants we mean manufacturers and retailers in both click-and-mortar and online-only business models.

<sup>2</sup> Credit card issuers commonly reward “cash back” to card holders when they make payments by cards; however it is different from the “cashback” as discussed in this paper in two aspects. First, the former merely incentivizes card holders to use the cards whereas the latter further allows merchants to price-discriminate among consumers. Second, card issuers run the reward programs and dictate cash back percentages without taking merchants' interest into account. In our cashback model, however, merchants will decide whether to affiliate with intermediaries, and that given an affiliation is formed, cashback rates are then determined through a process in which both merchants and intermediaries are involved.

## Practice and Problem

The cashback affiliate is a novel marketing approach featuring both online advertising and digital promotion. Once affiliating with a cashback intermediary, a merchant (advertiser)<sup>3</sup> can post an “*affiliate link*” on the publisher’s site. This hyperlink re-directs consumers to the merchant’s online storefront where purchasing transactions are taken place. The cashback intermediary (publisher), as a transaction broker, collects a commission from a merchant when consumers make transactions through the referral link. It then entices consumers into purchasing by rewarding them with a predetermined portion of the transactional amount, also known as cashback.<sup>4</sup> This monetary incentive to consumers makes the cashback affiliate one of the most effective advertising approaches.

The cashback model is also a promotional vehicle which allows the merchant to pursue segmentation by price-discriminating among consumers. Products can be listed for one price for non-cashback users and a lower price for the cashback users at the same time. In practice, cashback holds advantages over others alternatives such as coupons and mail-in rebates in two aspects. First, from a consumer’s perspective, this concept is straightforward. Searching for coupons or coupon codes could be time-consuming and the promotions are redeemable under some terms and conditions only (e.g., prior to expiration date). The redemption cost associated with mail-in rebates is state-dependent and is thus uncertain to consumers (Lu and Moorthy 2007). Cashback on the contrary has the capability of providing constant and certain discount. Second, from a merchant’s perspective, the cashback practice is simple yet efficient. Companies seek outside marketing solution like affiliate marketing because they are struggling to reach desired consumer segments by themselves. Take coupon for example. According to NCH Marketing Services, in 2012, coupon redemption rate is as low as 3.5% in the United States. This low figure exhibits the inefficiency concern about traditional mass-media promotion. Cashback sites, with a huge loyal user base, provide an efficient solution for targeting promotion.

Despite its prevalence in the practice, the cashback affiliate model has received almost no attention from researchers. Motivated by the lack of theoretical examination on this still-nascent marketing approach, we develop an analytical framework to fully understand the strategic use of the cashback affiliate model. In this paper, we are interested in answering the following questions:

- When should a merchant adopt the cashback model?
- Given a merchant affiliates with the publisher, how should they set their respective pricing terms?
- How would the introduction of cashback impact consumer surplus and social welfare?

## Literature Review

Literature on price discrimination provides the theoretical fundamental for our research framework. Price discrimination is only feasible when three conditions are met: (i) sellers have market power, (ii) arbitrage is infeasible, and (iii) buyers differ in their demands for a good or service and they can be segmented either directly or indirectly (Stole 2007; Varian 1989). Several analytical models are developed to examine the rationale of price dispersion (Salop and Stiglitz 1982; Shilony 1977; Varian 1980). Price discrimination is commonly thought as a weapon for firms to make extra profit.<sup>5</sup> However, based on experiences with several major firms, Neslin and Shoemaker (1983) argue that most managers do not have good methods

<sup>3</sup> While practitioners call businesses who have adopted advertising models *advertisers*, it is more appropriate to use a more general term *merchants* instead of advertisers since in this paper we examine whether businesses should adopt the underlying model.

<sup>4</sup> To earn cashback, a consumer needs to: (1) register for membership at a cashback site, (2) click on a merchant’s referral link which will direct the shopper’s browser to the merchant’s own website, and (3) make a purchase. Accumulated cashback can be claimed via checks or Paypal online transfers. Some sites (e.g., MrRebates.com) provide price-comparison feature and merchant-specific coupon codes which allow consumers to obtain a bigger discount.

<sup>5</sup> Strictly speaking, two more premises are required to make this argument valid. First, the merchant’s segmentation strategy should be effective, i.e. charging right prices to right types of consumers. Second, and perhaps the more importantly, the revenue gain of doing such practice should be greater than the cost incurred. Most of the extant analyses on price discrimination neglect these two important factors.

for computing the overall profitability of a proposed promotion program. Anderson and Dana (2009) develop a monopoly pricing model and characterize the conditions under which price discrimination is profitable.

The stream of research investigating promotional vehicles in monopoly is most related to this work. Narasimhan (1984) demonstrates that coupon users are different from nonusers. Since then, a variety of promotional methods are developed by marketers and investigated by researchers. For example, coupons take various formats such as direct mail coupons (e.g., Bawa and Shoemaker 1987), newspaper coupons (e.g., Neslin 1990), package coupons (e.g., Raju et al. 1994), cross-ruff coupons (e.g., Dhar and Raju 1998), and digitalized coupons (Oliver and Shor 2003). Researchers are also interested in key factors that influence a firm's choice among different alternatives. For example, a promotional vehicle's expiration date (long- vs. short-duration) and redemption timing (front-loaded vs. rear-loaded) also determines its probability (Inman and McAlister 1994; Krishna and Zhang 1999; Zhang et al. 2000). Promotional vehicles are also used to meet different business objectives. Gerstner and Hess (1991) argue that the manufacturer can motivate retail participation by using rebates. Firms can also incorporate promotion into pricing strategy for better customer retention (Shin and Sudhir 2010).

This paper is also related to ones focusing on the role of promotional methods in an oligopolistic setting. Shaffer and Zhang (1995) consider a market in which two competing firms can distribute coupons either to targeted consumers or via mass media. They demonstrate that coupon targeting leads to a prisoner's dilemma which makes both firms worse off. Corts (1998) find similar result by demonstrating that competing firms may wish to refrain from price discrimination. A relevant search question is also explored in a more general setting with two asymmetric firms. Lal (1990) and Rao (1991) conclude that in equilibrium national brands should promote to mitigate encroachment by a private label. Dogan et al. (2010), on the other hand, find that if one firm has absolute competitive advantage over its rival, in the equilibrium the disadvantaged firm would offer rebates alone.

Although the volume of extant research on promotion is vast, our work contributes to the literature in the following aspects. First, to the best of our knowledge, this paper is the first one directly studying the still-nascent cashback model and examining the strategic use of such unique promotional method. Second, we explicitly consider the implementation costs associated with the underlying model, which are treated exogenous in most, if not all, of prior literature on promotion methods. Third, our stylized model endogenizes the prices of advertised products as a decision variable of merchants' profit function, which are commonly assumed to be given exogenously in the advertising literature.<sup>6</sup> These analytical advantages provide a sharper and more conclusive insight into the merchant's best affiliate and pricing strategy.

## **Basic Model**

In this section, we first introduce the consumer response, consumer segments, and the merchant's pricing alternatives, when the cashback affiliate is absent. The preliminaries developed from non-cashback pricing serve as a benchmark for our analysis of the cashback mechanism. Next, we set up the cashback pricing model and derive optimal pricing decisions at equilibrium.

### ***Non-Cashback Pricing – A Benchmark***

*Consumer response.* In the spirit of Salop's model (1979), we assume that consumers are uniformly distributed on a preference line.<sup>7</sup> The location of a consumer identifies the ideal bundle of product attributes she prefers. The reservation price a consumer would like to pay for her ideal product is  $V$ . A product at distance  $x$  away from the consumers generates a utility of  $V - tx$ , where  $t$  measures consumers' sensitivity to horizontal product preference. After accounting for the price effect, consumers with location  $x$  away from the product derive a transaction utility of  $U(x) = V - p - tx$ . Each consumer has a unitary demand and will buy the product if the transaction utility is non-negative. As a result, the demand can be

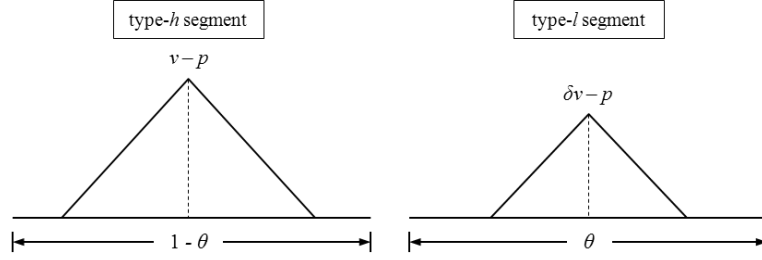
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<sup>6</sup> Few exceptions are Dellarocas (2012), Chen and He (2011), and Feng and Xie (2007)

<sup>7</sup> Since our research interest is in merchants' pricing strategy rather than product positioning, Salop's model allows us to ignore firm's location decisions, which is a common concern in IS spatial model literature (see Dewan et al 2003 for example).

expressed by  $Q(p) = 2(V - p) / t$ .

**Consumer segments.** Consider a market with total number of consumers normalized to one. The market is composed of two types of consumers,  $l$  and  $h$ , with fraction  $\theta$  and  $1-\theta$ , respectively. For a given product, type- $h$  consumers have a reservation price  $v$ , whereas type- $l$  consumers have a lower reservation price  $\delta v$ , where  $\delta \in (0, 1)$ <sup>8</sup>. When type- $l$ 's relative valuation is low, (i.e.,  $\delta$  is small) we say the valuation difference between two consumer types is salient. Given the model setting, the demand generated from type- $l$  and type- $h$  segments are  $Q_l(p) = \theta \cdot 2(\delta v - p) / t$  and  $Q_h(p) = (1-\theta) \cdot 2(v - p) / t$ , respectively. Throughout this paper we consider the market diverse enough and hence exclude the case where market is fully covered.<sup>9</sup> The market configuration, measured by  $(\theta, \delta)$ , plays an important role in determining firms' pricing strategy, as we shall see shortly.



**Figure 1. Consumer Segments and Response**

**Merchant's pricing problem.** Consider a market served by a monopolist. With the simplest pricing scheme, the merchant may charge a uniform price  $p_u$ , to the entire market and face a simple pricing problem given by:

$$\max_{p_u} \pi_m^U = p_u \cdot Q_l(p_u) + p_u \cdot Q_h(p_u) . \quad (1)$$

Maximizing Equation (1) we have the optimal uniform price,

$$p_u^* = \begin{cases} \frac{v}{2}, & \text{if } (\theta, \delta) \in R_H; \\ (\theta\delta + 1 - \theta)\frac{v}{2}, & \text{otherwise,} \end{cases} \quad \text{where } R_H = \left\{ (\theta, \delta) \mid 0 < \theta < \frac{1-2\delta}{(1-\delta)^2}, \delta < \frac{1}{2} \right\}.$$

The optimal uniform price is dependent of market configuration. When market parameters  $(\theta, \delta)$  fall in the region  $R_H$ , the merchant would set the price at  $v/2$  and serve type- $h$  consumers only. When  $(\theta, \delta) \notin R_H$ , it has incentive to serve both segments and charge one half of the total market valuation.

Now assume the monopolist can accurately identify consumers' type with no cost. The merchant may want to price-discriminate consumers by charging two asymmetric prices: a low price  $p_l$ , to the low type and a high price  $p_h$ , to the high type. As a result, the merchant's profit maximization problem with discriminating pricing is given by:

$$\max_{p_l, p_h} \pi_m^D = p_l \cdot Q_l(p_l) + p_h \cdot Q_h(p_h) , \quad (2)$$

The asymmetric prices allow the merchant to separately maximize its profit in two different segments.

<sup>8</sup> The setting of asymmetric reservation price is widely adopted in marketing and economic literature on price discrimination. See Lu and Moorthy (2007) and Desai (2001) for example.

<sup>9</sup> We have such model restriction for two reasons. First, since the main focus of this paper is the effect of price on product sales, we find it unrealistic to assume that product sales remains the same (market is covered) when price changes. Second, when market is covered, the publisher's decision could be restrained to the corner solution.

Maximizing Equation (2) gives the optimal asymmetric prices  $p_l^* = \delta v / 2$  and  $p_h^* = v / 2$ . Comparing pricing terms under two different schemes yields the following observations.

LEMMA 1. (i) *The optimal pricing terms follow the pattern:  $p_l^* < p_u^* \leq p_h^*$ ; (ii) The ability to price discriminate makes the merchant better off, i.e.  $\pi_m^D > \pi_m^U$ . All inequalities hold regardless of market configuration.*

In the absence of cashback, when a firm switches from uniform to discriminating pricing, it lowers the price for type- $l$  segment while raises the price for the other. In other words, the uniform price is bound between two asymmetric prices. In addition, discriminating pricing is always preferred if a merchant can identify consumers' type without any cost. Given these observations, we ask: Do these arguments still hold in the presence of cashback model?

### Cashback Model

Since reservation price is asymmetric across segments, the merchant has incentive to charge different prices to different segments. However, it cannot not directly distinguish different types of consumers. Cashback, a mechanism which allows consumers to self-select themselves into correct types, can serve as a price discrimination device. Although the majority of online advertising literature assumes the price of advertised products to be exogenous, we think it is more realistic to endogenize the price decision into firms' profit maximization problem. In our analytical framework, the merchant first decides whether or not to adopt cashback affiliate and subsequently sets the prices. For exposition purpose, our analysis proceeds in the reverse direction. We first analyze firm's optimal prices given the affiliation is formed. Then we examine whether the merchant should adopt the affiliate model at all.

A merchant who adopts cashback affiliate is actually operating an electronic dual-channel. When a consumer desires to buy a certain product, she could purchase it directly from the merchant's e-commerce website (direct channel<sup>10</sup>) or via the affiliate link on a cashback site (cashback channel). Of course, cashback shopping is not costless to consumers. Cashback shoppers incur transaction costs that include the disutility derived from extra works throughout cashback shopping process such as registering on the publisher, searching for the merchants, clicking through affiliate links, and waiting for rewards to be redeemable<sup>11</sup>. Nevertheless, a consumer would still choose to shop through the cashback channel if the monetary incentive obtained from cashback is greater than the transaction costs. In the case where transaction costs are perceived to be higher, the consumer is assumed to make the purchase via the direct channel.

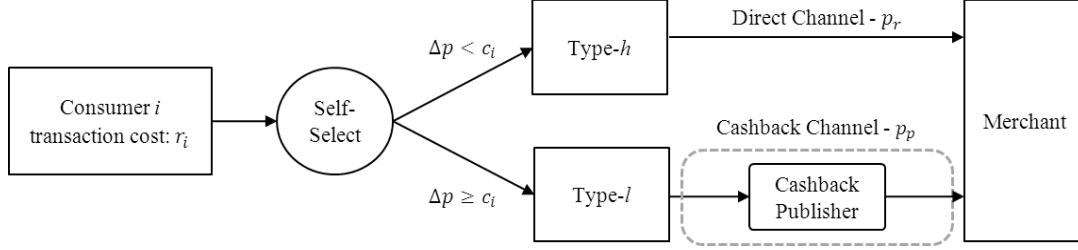
Denoting the transaction costs incurred from cashback shopping by  $c_i$  ( $i = l, h$ ), and since the values of time are different across segments, we assume that the costs are lower for type- $l$  consumers, i.e.  $c_l < c_h$ . The assumption that transaction cost is positively correlated with the reservation price is widely accepted in the prior literature (Coughlan and Soberman 2005). Without the loss of generality, we normalize  $c_l$  to zero. This normalization is justifiable in the following senses. From a consumers' perspective, cashback shoppers are a group of consumers who value saving beyond the time associated with getting discounts (Swan 2010). From an analytical perspective, the incentive for price discrimination still holds even if  $c_l > 0$ , as long as  $c_l < c_h$  (Gerstner et al. 1994).

Consumers self-select whether to pay a regular price  $p_r$ , or a lower post-cashback price<sup>12</sup>  $p_p$ , depending on whether they participate on the cashback site. The relative magnitude between one's transaction cost  $c_i$ , and the incentive obtained from cashback shopping,  $\Delta p$  (defined as  $\Delta p = p_r - p_p$ ), determine the self-selection outcome (Figure 2).

<sup>10</sup> By the direct channel we mean a merchant's e-commerce storefront, while the term can be generalized to include the merchant's physical stores.

<sup>11</sup> It usually takes 30-60 days for the rewards to be available for redemption.

<sup>12</sup> The post-cashback price is an *ex post* one perceived by consumers after factoring in with the cashback rewards.



**Figure 2. Consumer's Self-selecting Mechanism via an Electronic Dual-channel**

To best model the current cashback practice, we consider a three-stage Stackelberg game with two players: a merchant and a cashback site. Unless otherwise indicated, we use the site and the publisher interchangeably. In the first stage, the merchant decides whether or not to affiliate with the cashback site. If the affiliation is formed, the merchant then chooses a regular price  $p_r$  and a commission rate  $b$  ( $b \in [0, 1]$ ) in the second stage. From the merchant's perspective, this commission can be considered the cost to pay for being able to price-discriminate. In the last stage, the intermediary site makes  $b$  times the sales revenue it brokers. Meanwhile it chooses a cashback rate  $a$  ( $a \in [0, b]$ ), and rewards publisher users with  $a$  times transactional amount in a form of cashback. The site incurs a zero marginal cost since it merely operates as an intermediary and does not directly deal with transactions (see Section 1.1 for industry practice). The merchant's marginal cost is assumed constant and can be normalized to zero by interpreting consumers' reservation price as net of marginal cost. Two firms work independently<sup>13</sup> and maximize their respective profits:

$$\max_{p_r, b} \pi_m^C = p_r(1-b) \cdot Q_l(p_p) + p_r \cdot Q_h(p_r), \quad (3)$$

$$\max_a \pi_p = p_r(b-a) \cdot Q_l(p_p), \quad (4)$$

where  $p_p = p_r(1-a)$ . The superscript  $C$  on  $\pi$  indicates cashback pricing and subscriptions  $m$  and  $p$  denote the merchant and the publisher (or, the cashback site), respectively.

For the cashback model to work as a price discrimination device, consumers' incentive compatibility (IC) constraints must be satisfied.<sup>14</sup> Critical readers may argue that the merchant's desire to sort out consumers is not necessarily aligned with the site's best interest, in that the site may have incentive entice also type- $h$  consumers by setting a higher cashback rate. In fact, this would never happen in practice. Once both consumer types become cashback shoppers, all consumers would pick the cashback channel and pay the lower price and therefore nominal asymmetric prices actually work as a uniform price. The merchant's net profit, defined as sales revenue subtracted by commission, is strictly less than the level that can be achieved by the optimal uniform price. If this were the case, the merchant would rather simply set a uniform price and leave the site, which ends up making a zero profit without commission. Such credible threat tightly aligns the interests of two affiliate partners under the cashback pricing model.

### Pricing Decision

Maximizing (2) and solving (3) and (4) using backwards induction gives two firms' optimal pricing terms.

**LEMMA 2.** *When adopting cashback pricing model, the merchant sets regular price  $p_r^* = \frac{v}{2}$ , and*

<sup>13</sup> To understand the cashback industry we conducted an interview with the president at a major cashback site in the U.S. Per interview minutes, merchants in practice have no control over the publisher's choice on cashback rate.

<sup>14</sup> Consumers' IC constraint is  $0 < \Delta p < c_h$ . If  $c_h$  is too small such that the interior solution doesn't exist, then we would end up with the corner solution  $a = c_h / p_r$ . The merchant's profit-maximization problem degenerates to a simple case with only one decision variable  $p$ . This scenario deviates from the main interest of this study, and hence we focus on the interior solutions for the rest of this paper.

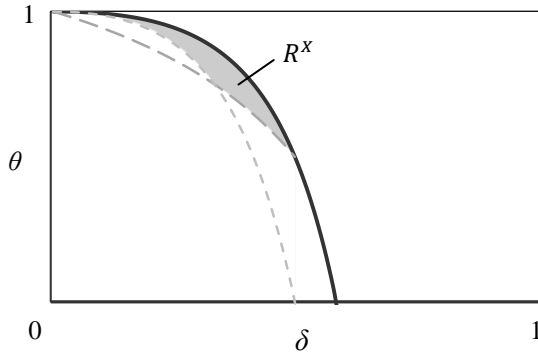
commission rate  $b^* = 1 - \delta$ . The cashback site chooses cashback rate  $a^* = 1 - \frac{3}{2}\delta$ .

With cashback mechanism operating as a price-discrimination device, the merchant is able to charge asymmetric prices across segments. It now can extract the highest surplus from type- $h$  consumers by increasing the price from  $p_u^*$  to  $p_h^*$ . Such price hike is consistent with the second inequality presented in Lemma 1 (i.e.  $p_u^* \leq p_h^*$ ). Following the first inequality of the same pattern (i.e.  $p_p^* < p_u^*$ ), one may expect the post-cashback price for type- $l$  consumers  $p_p^*$ , to be lower than the uniform level. However, our common intuition is not always the case in the presence of cashback mechanism.

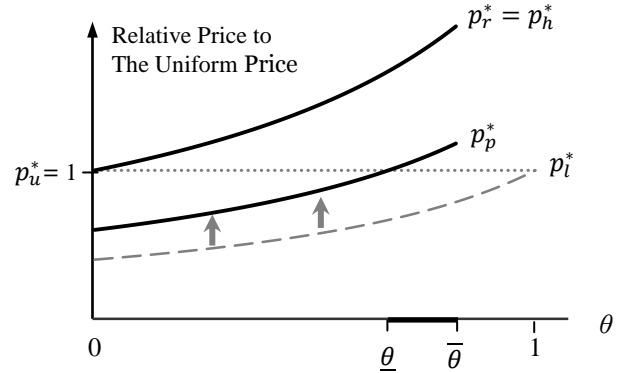
**PROPOSITION 1.** The “cashback paradox”, where post-cashback price is higher than the uniform price, will happen as long as market configuration falls in the region  $R_X = \left\{ (\theta, \delta) \mid \underline{\theta} < \theta < \bar{\theta}, \delta < \frac{1}{2} \right\}$ ,

$$\text{where } \underline{\theta} = \begin{cases} \frac{1-2\delta}{(1-\delta)^2}, & \text{if } 0 < \delta \leq \frac{1}{3}; \\ \frac{2-3\delta}{2-2\delta}, & \text{if } \frac{1}{3} < \delta < \frac{1}{2}, \end{cases} \text{ and } \bar{\theta} = 1 - \frac{\delta^2}{2(1-\delta)^2}.$$

From consumers' perspective Proposition 1 indicates a shocking result. Cashback shopping provides an attractive saving opportunity for bargain hunters as the prices they pay are perceived lower. Surprisingly, under some conditions the seemingly “low” post-cashback price is actually more expensive, relative to the uniform price in settings where price discrimination is absent. As a consequence, after the cashback promotion is implemented consumers regardless of their types end up facing a higher price (i.e.  $p_r^* > p_p^* > p_u^*$ ).



**Figure 3. Region for Promotional Price Paradox**



**Figure 4. Asymmetric Prices vs. Uniform Price**

Figure 3 plots the market configuration region  $R_X$  (on a  $\theta$ - $\delta$  coordinate) in which the *cashback paradox* will occur. What is the driving force behind such counterintuitive result? Recall From Lemma 1 that the optimal uniform price  $p_u^*$ , is bound between  $p_l^*$  and  $p_h^*$ . Figure 4 illustrates various optimal prices as a function of  $\theta$ .<sup>15</sup> Clearly, when  $\theta=0$ ,  $p_u^* = p_h^*$  as all consumers are high type; when  $\theta=1$ ,  $p_u^* = p_l^*$  as all consumers are low type. In the current industry practice, the merchant exerts no control over the site's choice of commission rate. The ability to set commission rate  $a$  allows the site to seek its own highest profit margin. This pricing structure is an analogy to a traditional supply chain setting (Dellarocas 2012) where the manufacturer and the retailer independently choose their respective prices. The upward price

<sup>15</sup> For presentation purpose,  $p_r^*$  and  $p_p^*$  are truncated at  $\theta = \bar{\theta}$  since beyond this point the merchant will switch back to the uniform pricing. Details on affiliate decision will be discussed in the next subsection. The figure is plotted with  $\delta=0.4$ .



distortion stems from double marginalization raises the price targeted at type- $l$  consumers from  $p_l^*$  to  $p_p^*$ . Interestingly enough, when  $\theta$  lies in the interval  $[\underline{\theta}, \bar{\theta}]$ , the merchant can still make a higher net profit by simultaneously increasing two asymmetric prices, compared to the highest profit that can be achieved by a uniform price. The explanation to this counterintuitive result is given as follows. When the merchant has incentive to serve both segments, the optimal uniform price  $p_u^*$ , is decreasing with the fraction of type- $l$  consumers  $\theta$ . If  $\theta$  is sufficiently large (i.e.  $\theta > \underline{\theta}$ ), the uniform price is relatively low, compared to the optimal price when only type- $h$  segment is served. Under this condition cashback affiliation not only allows the merchant to extract the highest surplus from high-type consumers but also generates a positive net profit from low-type ones. It is worth noting that while we assume linear demand for simplicity, none of our analyses are dependent on this assumption.<sup>16</sup>

### Affiliate Decision

When should the merchant affiliate with the cashback site? The subgame perfect equilibrium gives the answer.

PROPOSITION 2. *The merchant's best affiliate decision  $D = \begin{cases} \text{affiliating,} & \text{if } (\theta, \delta) \in R_p, \\ \text{not affiliating,} & \text{otherwise,} \end{cases}$*

$$\text{where } R_p = \left\{ (\theta, \delta) \mid \theta < \bar{\theta} = 1 - \frac{\delta^2}{2(1-\delta)^2}, \delta < \bar{\delta} = 2 - \sqrt{2} \right\}.$$

We have shown (in Lemma 1) that discriminating pricing is always preferred to uniform pricing when price setter can discriminate consumers costlessly. Proposition 2 suggests that the merchant should adopt the cashback pricing model as long as market configuration falls in the *profitable region*,  $R_p$ . From a merchant's perspective, the profitability of the underlying mechanism is determined by two components: (1) the revenue gain resulted from being able to price-discriminate and (2) the cost incurred in order to obtain such pricing weapon (i.e. the commission pays to the publisher). In what follows, we examine the effect of market parameters on the merchant's affiliate decision.

When the fraction of type- $l$  consumer  $\theta$  is fixed, the advantage of discriminating pricing over uniform pricing is diminishing in type- $l$ 's valuation coefficient  $\delta$ . If the valuation gap between two segments vanishes ( $\delta=1$ ), the optimal uniform price yields the highest profit. When  $\delta$  is fixed, the fraction of type- $l$  consumers,  $\theta$ , moderates attractiveness of the cashback affiliate. A high value of  $\theta$  implies more sales volume is generated via the cashback channel, and therefore the merchant pays a larger portion of its total revenue to the site. Combined, these two effects suggest that the cashback model is profitable if and only if  $\theta$  and  $\delta$  are sufficiently small. As  $(\theta, \delta)$  becomes smaller (larger), the market will shift towards (away from) the cashback model. We will use this principal to facilitate our subsequent discussion.

Current cashback practice suffers from market efficiency loss caused by double marginalization. Arguing that two affiliate partners can split the profit through a bargaining process, we propose a potential solution to mitigate the undesirable outcome identified in our model.

### Cashback Coordination

We have examined when and how the cashback model can be used as a price discrimination device. What remains unclear so far is the impact of the underlying mechanism on consumers as a whole and on the entire society. In this section, we first present a welfare analysis of the current cashback practice. Then, we propose an alternative approach to improve market inefficiency which stems from double marginalization.

Our discussion on welfare proceeds in the following two cases. When  $(\theta, \delta) \in R_H$ , the monopolist with uniform pricing would set  $p_u = v/2$  and serve the high-type only. In the presence of the cashback mechanism, the merchant can now set the same price  $p_h = v/2$  for type- $h$  segment and meanwhile provides

<sup>16</sup> The impact of double marginalization, including price distortion and welfare reduction, would be stronger if the marginal revenue curve is convex, since the publisher would try to get a bigger pie by setting a cashback rate further from the channel optimum.

a lower price  $p_p$  for the other. In this case, the cashback practice possesses all the merits: it increases overall consumer surplus, sellers' surplus and social welfare. When  $(\theta, \delta) \notin R_H$ , however, the implementation of the current cashback practice leads to a reduction in overall consumer surplus and social welfare, compared to the level under uniform pricing. This reduction in both welfare measurements echoes prior literature (e.g., Schmalensee 1981) since the aggregate output decreases due to the upward price distortion. The affiliated merchant makes  $(1-\theta) \cdot v^2/2t$  from its direct channel and  $\theta \cdot (\delta v)^2/4t$  from the cashback channel. The intermediary site receives sales commission  $\theta \cdot (\delta v)^2/8t$ . Since each firm is able to set its own profit margin, two sellers' joint profit, given by  $(4(1-\theta)v^2 + 3\theta(\delta v)^2)/8t$ , is below the joint optimum  $((1-\theta)v^2 + \theta(\delta v)^2)/2t$  if the work as an integrated firm (Jeuland and Shugan 1983). In our research context, coordination between two affiliate partners in determining cashback rate is the most straightforward solution to this problem. In what follows, we identify conditions under which cashback coordination can be achieved through a bargaining mechanism. For distinction purpose, we call our proposed mechanism *Coordinated Cashback*, as opposite to the current cashback practice.

### Bargaining Process and Coordination

We denote the cashback site's and merchant's bargaining power by  $\varphi$  and  $1-\varphi$ , respectively. Following the prior literature, the values of bargaining parameters are exogenous and may depend on each party's relative market power such as market value, brand image, etc. The merchant and the site (hereafter we call them *sellers* for brevity) bargain over the cashback rate. If bargaining fails, two firms resort to their outside options which are determined by market configuration. If revenue of the current cashback model is verifiable, two firms would play the Stackelberg pricing game. Otherwise, no affiliation would be formed and the site earns a zero profit. The sellers' respective outside options, denoted by a superscript "O", are given by:

$$\pi_m^O = \begin{cases} \pi_m^C = \frac{\theta(\delta v)^2}{4t} + \frac{(1-\theta)v^2}{2t} & \text{if } (\theta, \delta) \in R_p, \\ \pi_m^U = \frac{(\theta\delta + 1 - \theta)v^2}{4t} & \text{otherwise;} \end{cases} \quad \pi_p^O = \begin{cases} \pi_p^C = \frac{\theta(\delta v)^2}{8t} & \text{if } (\theta, \delta) \in R_p, \\ \pi_p^U = 0 & \text{otherwise.} \end{cases}$$

In its simplest presentation, the Nash bargaining solution (Nash 1950)<sup>17</sup> is the solution  $(p_c, a_c)$  to maximize sellers' joint profit:

$$\max_{p_c, a_c} \Pi^I = \Pi_p^I + \Pi_m^I = p_c(1-a_c) \cdot Q_l(p_c(1-a_c)) + p_c \cdot Q_h(p_c),$$

where  $\Pi^I$  denotes the sellers' joint profit when two affiliate partners coordinate and work as an integrated firm. Following the split-the-difference rule (Muthoo 1999), two firms' profits under coordination is allocated by  $\pi_m^I = (1-\varphi) \Pi^I + \Pi_m^O$  and  $\pi_p^I = \varphi \cdot \Pi^I$ , respectively.

The success of the bargaining process eliminates double marginalization by dropping the site's choice of commission rate. Exogenous bargaining parameters serve to allocate the profit generated through the cashback channel. When  $\varphi$  is large, the site receives a big pie of  $\Pi_p^I$ , making coordination less attractive to the merchant. When  $\varphi$  is small, the site would leave the bargaining table because of insufficient incentive. Therefore, we can expect that channel coordination can be achieved when the value of  $\varphi$  is bound between some critical numbers.

**PROPOSITION 3.** There is an interval  $\hat{\varphi}$  for the cashback site's bargaining power, such that both firms have incentive to coordinate and split the revenue by their relative bargaining power, where

<sup>17</sup> We choose Nash bargaining solution over Rubinstein model because we assume each consumer's demand is unitary and the cashback game is a static one-shot game.

$$\hat{\phi} = \begin{cases} \frac{1}{4} < \phi < \frac{1}{2}, & \text{if } (\theta, \delta) \in R_p; \\ 0 < \phi < \frac{(1-\theta)(1-\delta)^2}{\delta^2}, & \text{otherwise.} \end{cases} \quad (5)$$

Clearly, the interval  $\hat{\phi}$  depends upon the market configuration. When  $(\theta, \delta) \in R_p$ , two firms have incentive to coordinate in choosing commission rate as long as the merchant's bargaining advantage<sup>18</sup> is moderate. When  $(\theta, \delta) \notin R_p$ , since the site's outside option is zero ( $\pi_p^o = 0$ ), any positive value of  $\phi$  can incentivize the site to coordinate. As a result, our proposed mechanism is sustainable as long as the publisher does not claim too much share of revenue generated from type- $l$  consumers (i.e.  $\phi$  is sufficiently small). Figure 5(a) depicts the interval  $\hat{\phi}$  as a function of  $\delta$  ( $\theta=0.5$ ).

Figure 5(b) illustrates the upper bound of  $\hat{\phi}$  when  $(\theta, \delta) \notin R_p$ . Since  $\delta$  moderates attractiveness of price discrimination devices<sup>19</sup>, a large value of  $\delta$  shrinks the interval  $\hat{\phi}$ . The value of  $\theta$  has a similar impact, as shown in the same plot. The intuition is that it is harder to align two firms' interest when market shifts away from discriminating pricing. When  $(\theta, \delta) \in R_p$ , however, neither  $\delta$  nor  $\theta$  has impact on  $\hat{\phi}$ . This is because the revenue of the current cashback model is verifiable and profit-sharing scheme is independent of market configuration.

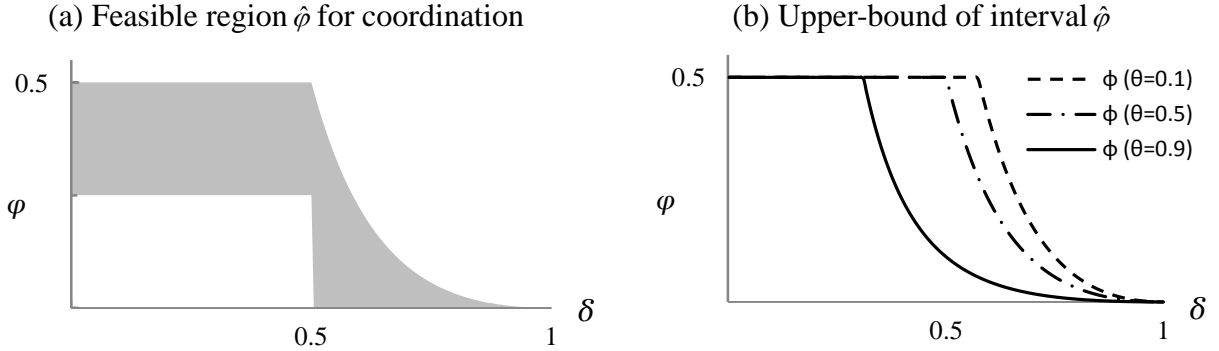


Figure 5. Coordination condition,  $\hat{\phi}$ , as a function of  $\delta$

### Welfare Improvement

Now, we demonstrate how our proposed mechanism provides a more efficient approach to practice price discrimination. From sellers' perspective, this alternative approach expands the cashback model's profitable region by taking bargaining power into decision making process. The bargaining process ensures a win-win situation for both firms. As seen in Figure 6, while the current practice outperforms the uniform pricing when  $\delta \leq \bar{\delta}$ , the success in bargaining makes both firms better off as long as  $\delta \leq \tilde{\delta}$ .<sup>20</sup>

From buyers' perspective, coordinated cashback increases consumer surplus by restoring the price targeted at low-type segment from  $p_p^*$  to  $p_l^*$ . The left panel of Figure 7 shows that consumer surplus under coordinated cashback (black solid lines) dominates the current practice (gray dashed lines). The cashback paradox will never occur under this profit-sharing scheme. Social welfare (SW) has an unambiguous increase (the right panel of Figure 7). The cashback coordination discussed in this section is different from coordination achieved by a profit-sharing contract in that the former is analyzed under a price-discrimination and dual-channel framework.

<sup>18</sup> By construct, the merchant's bargaining advantage is  $(1-\phi) - \phi = 1-2\phi$ .

<sup>19</sup> A detailed discussion is given in previous section.

<sup>20</sup> We derive  $\tilde{\delta}$  by arranging the bottom line of Equation (5). The figures are plotted with  $\theta=0.5$  and  $\phi=0.3$ .

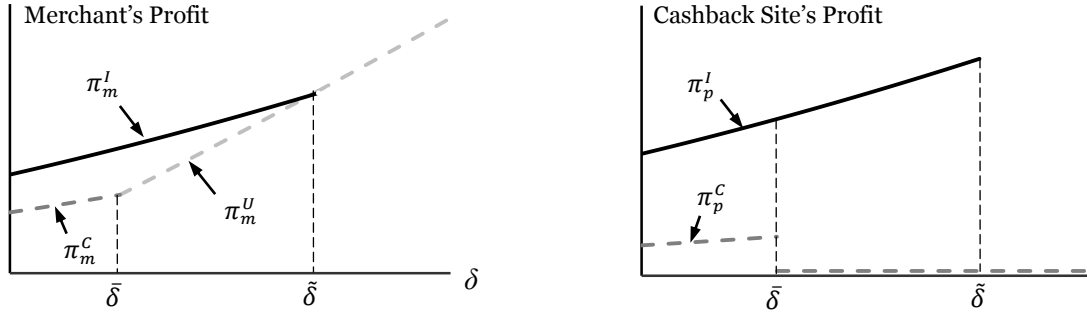


Figure 6. Coordinated Cashback vs. Current Cashback

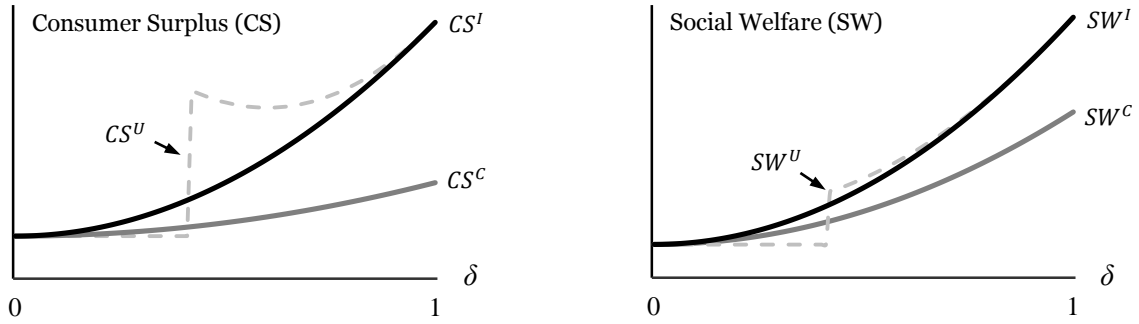


Figure 7. Comparing Consumer Surplus and Social Welfare

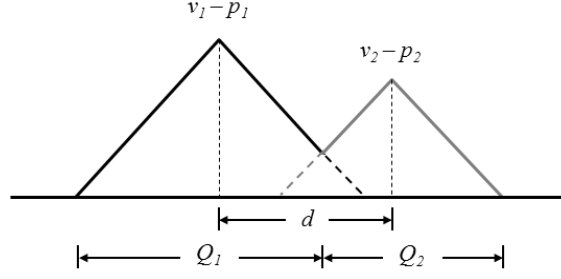
## Optimal Pricing Strategy in Duopoly

Based on a monopoly setting, we have identified unique properties of the cashback model. We now turn our attention to merchants' pricing and affiliate decision in the presence of competition. In what follows, we base our analysis on a duopoly while our framework can be generalized to an oligopolistic setting.

*Duopoly setting.* Consider a market served by two merchants ( $M_1$  and  $M_2$ ) who sell differentiated products. Motivated by Dogan et al. (2010), we consider the differentiation both horizontal and vertical. On one hand, products offered by different merchants have various combinations of attributes. Such horizontal difference is modeled in the following way: two competing merchants are located at two different positions on consumers' preference horizon.<sup>21</sup> Each merchant has its own brand valuation. Factors determining a merchant's brand valuation could be its brand image, level of customer services, reputation, etc. We assume type- $h$  consumers have brand valuation of  $v_j$  for  $M_j$  whereas type- $l$  consumers have brand valuation of  $\delta v_j$  for  $M_j$  ( $j=1,2$ ). Without the loss of generality, we assume  $v_1 > v_2$  and we call  $M_1$  a superior merchant.

Denoting the distance between two merchants' locations by  $d$ , we model the intensity of competition between merchants by the reciprocal of  $d$ . A smaller  $d$  represents a higher degree of competition. Figure 8 illustrates type- $h$  consumers' transaction utility derived from two differentiated products. A consumer would prefer to purchase from the merchant who gives her a higher utility. Consumers located at the projection of the intersection of two inwards utility segments on the preference horizon are indifferent between buying from either merchant. Similarly, consumers located at the intersection of  $M_j$ 's utility segment and preference horizon are indifferent between buying  $M_j$ 's product and not buying at all.

<sup>21</sup> The reasons why we choose Salop's model over Hotelling's are given as follows. First, Salop's model allows us to ignore firm's location decisions, which is a common concern in marketing and IS spatial model literature (see Dewan et al. 2003 for example). Second, Salop's model is more flexible in a sense that it can be easily extended to a multiple-merchant case. Lastly and perhaps most importantly, Hotelling's spatial model cannot model the publisher's decision when the competition between merchants is present. This is because when market is fully covered, the publisher would have no decision to make.



**Figure 8. Consumers' Choice Over Differentiated Products (Type-h)**

To simplify notations, we move some notations to superscripts. In a general format, the merchant  $j$ 's profit maximization problem, conditional on its affiliate decision, are given by:

$$\begin{aligned} \max_{p_j^r, b_j} \pi_j^A &= p_j^r \cdot Q_j^h(p_j^r, p_{-j}) + p_j^r(1-b_j) \cdot Q_j^l(p_j^r, p_{-j}) \quad \text{if affiliating,} \\ \max_{p_j^u} \pi_j^U &= p_j^u \cdot Q_j^h(p_j^u, p_{-j}) + p_j^u \cdot Q_j^l(p_j^u, p_{-j}) \quad \text{otherwise,} \end{aligned}$$

and the publisher's problem is given by:

$$\max_{a_j} \pi_p = \sum_j^{1,2} p_j^r(b_j - a_j) \cdot Q_j^l(p_j^r, p_{-j})$$

where  $p_{-j}$  denotes the price set by  $M_{-j}$  and is dependent on  $M_{-j}$ 's affiliate decision.

### Optimal Pricing Decisions

The fact that a merchant's profit also depends on the rival's affiliate decision adds extra difficulty to our duopolistic model. Since each firm has to decide whether or not to affiliate, there are four possible market outcomes: both merchants affiliate,  $M_1$  affiliates alone,  $M_2$  affiliates alone, and neither merchant affiliates. To derive the subgame perfect solutions, we first solve the third-stage publisher's profit maximization problem, given that two merchants' affiliate and pricing decisions are known.

**LEMMA 3-1.** *The optimal cashback rates  $\{a_1^*, a_2^*\}$  under the competitive market outcome are:*

$$\{a_1^{B*}, a_2^{B*}\} = \left\{ \frac{1+b_1}{2} - \frac{dt+2\delta v_1}{4p_1}, \frac{1+b_2}{2} - \frac{dt+2\delta v_2}{4p_2} \right\}.$$

The second-stage solutions suggest that the site's optimal cashback rate is increasing with the commission rates chosen by the merchants. This finding is consistent with the cashback rates observed on a typical site. For example, merchants belong to magazine/book category usually give a high commission rate (up to 50%) to the publisher, which in turn, assigns high cashback percentages to consumers. Having the solutions to the publisher's problem, we now are able to derive the merchants' best response in the second stage.<sup>22</sup>

**LEMMA 3-2.** *The merchant  $j$ 's optimal price and commission rate under the competitive cashback market where both merchants affiliate are:*

$$\{p_1^{B*}, b_1^{B*}\} = \left\{ \frac{17v_1 - 3v_2 + 7dt}{35}, \frac{(1-\delta)(17v_1 - 3v_2)}{17v_1 - 3v_2 + 7dt} \right\}; \{p_2^{B*}, b_2^{B*}\} = \left\{ \frac{17v_2 - 3v_1 + 7dt}{35}, \frac{(1-\delta)(17v_2 - 3v_1)}{17v_2 - 3v_1 + 7dt} \right\}.$$

The comparative statics of the optimal pricing terms under the competitive cashback market are summarized in Table 2. We find that the effect of brand valuation on price  $p$  and that on commission  $b$  move in the same direction. If a merchant is able to enhance its brand valuation, i.e.  $v_j$  is higher, it can

<sup>22</sup> We only present the solutions under the competitive market in the main text of this paper. Complete solutions are available upon request.

charge a higher regular price and assign a higher commission rate to the publisher. The increase in commission rate will in turn lead to a higher cashback percentage. Interpreting the magnitude of  $b_j$  as the attractiveness of cashback affiliate to a merchant  $j$ , we find that a merchant's incentive to adopt cashback mechanism is increasing with its own brand valuation  $v_j$ . This nature is helpful in explaining the market equilibrium derived in the next subsection. A merchant's optimal price and incentive to affiliate decrease with the competitor's brand valuation,  $v_{-j}$ . Unlike brand valuation, the effects of market parameters on merchant's pricing terms  $p$  and  $b$  move in the opposite directions. Recall that  $1/d$  measures the competition intensity between merchants. In a highly competitive market where horizontal product differentiation is insignificant, i.e.  $1/d$  is large, merchants would engage in a price war by cutting the price and taking a more aggressive price discrimination strategy (i.e. a larger  $b_j$ ). If consumers appreciate products attributes more than price, as modeled by a larger  $t$ , merchants would extract larger surplus by pushing the price upwards. If  $\delta$  is larger, indicating the valuation asymmetry between two segments is small, i.e. we will expect that price asymmetry across channels goes down.

<b>Table 2. Comparative Statics of the Optimal Price and Commission Rate</b>						
		Parameters				
		$v_j$	$v_{-j}$	$1/d$	$t$	$\delta$
Decision Variables	$p_j$	+	−	−	+	
	$b_j$	+	−	+	−	−

### ***Equilibrium of the Cashback Market***

Although we have solved for firms' pricing decisions, the solutions themselves do not constitute equilibrium (Dogan et al. 2010). To derive equilibrium conditions we need to further verify that neither merchant has incentive to deviate from a particular solution set by changing its affiliate decisions. The procedure of deriving subgame perfect equilibrium requires solving an inequality system with multiple parameters. To circumvent the complexity of searching through a multidimensional space, we resort to numeric analysis. The following lemma provides an interesting finding in the presence of competition.

**LEMMA 4.** *When a merchant adopts cashback affiliate, this move would also benefit its competitor.*

For discussion purpose, consider a scenario where  $M_1$  moves to the cashback market given  $M_2$ 's strategy is fixed. According to the nature of price discrimination,  $M_1$ 's price for type- $l$  segments would decrease in the most cases. Such price cut boosts  $M_1$ 's sales volume but hurts  $M_2$ 's. At the same time,  $M_1$  would increase the regular price; the price to pay here is to surrender some type- $h$  market share to  $M_2$ . As a result,  $M_2$  would be better off if  $M_1$  lessens the price competition in the more profitable high-type segment.

Now, we turn our attention to the conditions of market equilibrium. Recall that the attractiveness of the cashback model is decreasing with market parameters  $\delta$  and  $\theta$ . When the market configuration is *strongly* in favor of cashback mechanism, (i.e. close to the origin of the  $\theta$ - $\delta$  coordinate), affiliating is a dominant strategy for both merchants. A duopolist would benefit not only from its own move into cashback market but also from its rival's (Lemma 4). This win-win situation leads the market to a pure strategy equilibrium wherein both merchants affiliate and make the highest profit, compared to the profit they can achieve in any other equilibria. When the market configuration is against discriminating pricing (i.e. away from the origin of  $\theta$ - $\delta$  coordinate), both merchants lean towards conservation in affiliate, leading the market to an equilibrium wherein neither merchant affiliates. What remains unclear so far is the outcome when the market configuration is *weakly* in favor of the pricing tool. Since the profitability of the cashback model become ambiguous, one may conjecture that the asymmetric equilibrium wherein one merchant affiliates alone will emerge. We formally state our finding in the following proposition.

**PROPOSITION 4.** *When market configuration is weakly in favor of the cashback affiliate, at equilibrium market outcome depends on merchants' valuation difference  $\Delta v$ , where  $\Delta v = v_1 - v_2$ .*

1. *If  $\Delta v$  is small, both merchants have no incentive to affiliate alone but prefer its rival to do so. This unique characteristic leads the market to a hawk-dove game.*

2. If  $\Delta v$  is large, the cashback model is not profitable to the low-valuation merchant. At equilibrium only the high-valuation merchant would affiliate with the publisher.
3. If  $\Delta v = 0$ , two merchants are identical and as a result asymmetric equilibrium doesn't exist.

If  $\Delta v$  is small, merchants would play an anti-coordination game in which it is mutually beneficial for duopolists to play opposite strategies:  $M_j$  would like to affiliate only if  $M_{-j}$  does not; and  $M_j$  would prefer not to affiliate only if  $M_{-j}$  affiliates. Economists would use the *hawk-dove game* (also known as snow-drifting or chicken game) to describe this special scenario where multiple equilibria co-exist. In our research context, both merchants hope for the other to move, but neither does.

If  $\Delta v$  is sufficiently large,  $M_2$  would adopt the simple uniform pricing because the cost of the affiliation outweighs the benefit. Under this scenario  $M_1$  can still benefit from price discrimination. This finding is consistent with the literature stream arguing the advantageous firms should take a more aggressive promotion strategy (e.g., Rao 1991). Notably, our work provides a different insight from Dogan et al. (2010) who concluded that the equilibrium where only advantageous price-discriminates doesn't exist. What drives this difference is that we allow asymmetric reservation price across segments and generalize their assumption that all consumers have identical willingness to pay.

## Conclusion and Future Research

The primary objective of this paper has been to examine the strategic use of the still-nascent cashback affiliate model. By affiliating with the cashback platform, merchants are able to exercise second-degree price discrimination to increase profits. Despite the merits from sellers' perspective, cashback mechanism actually hurts consumer surplus and social welfare. Surprisingly enough, consumers as a whole could face a higher price after the introduction of cashback shopping. Arguing coordination can be achieved through a bargaining process, affiliated partners can make themselves better-off by improving channel efficiency.

This paper contributes to the literature in many aspects. We explicitly consider the implementation cost associated with the underlying promotional vehicles. In addition, we endogenizes the product prices as a decision variable into merchants' profit function. These analytical advantages allows us to obtain more precise insights into the attractiveness of the cashback model. This unique feature distinguishes our work from prior literature in promotions and channel control (e.g., Chiang et al. 2003). Our analytical framework is simple; yet, it can be generalized to other commission-based approaches.

This paper makes a few assumptions. First, the seller in our model face a linear marginal revenue curve based on the linearity of demand. However, none of our analyses are dependent of this assumption. One should expect, for example, the impact of double marginalization would be more severe if the marginal revenue curve is convex. Second, we assume that the consumers' sensitivity to horizontal differentiation (as represented by  $t$ ) is the same across segments. It could be case that type- $h$  consumers appreciate product attributes more than those of the other type. In fact, our results do not change significantly if we consider such specification. Intuitively, if  $t_h > t_l$ , a monopoly would have higher incentive to price-discriminate, making our analysis on affiliate decision conservative. In a duopoly setting, the merchant with lower brand valuation would benefit more from cashback marketing. Lastly, for the sake of model tractability we assume the transaction costs incurred in cashback shopping are discrete cross segments, since without this assumption the sellers' profit will be a cubic function and the equilibrium solution will turn out to be messy. Our analytical framework should give a similar result even if we release this assumption by allowing  $c_h$  to be continuous, with  $c_l$  still being equal to zero since cashback shoppers value savings more than time cost (Swan 2010). We should expect that the merchant's affiliate decision will depend on the tradeoff between additional demand generated by type- $h$  segment and lower margin per unit sold.

Future research could investigate the change of optimal profit-sharing scheme when multiple cashback sites are involved. In reality, a merchant does affiliate with multiple cashback platforms at the same time. The observation points out a series of new questions. Is multi-homing strategy more beneficial to a merchant? If so, how does multi-homing strategy influence the competition among merchants and how do platforms compete with each other? Moreover, network externality is one of key components to depict the nature of platform. Previous literature concludes that platforms fight for a penny to survive. However, we wonder whether or not the conventional intuition still holds when the cashback concept comes into play.

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